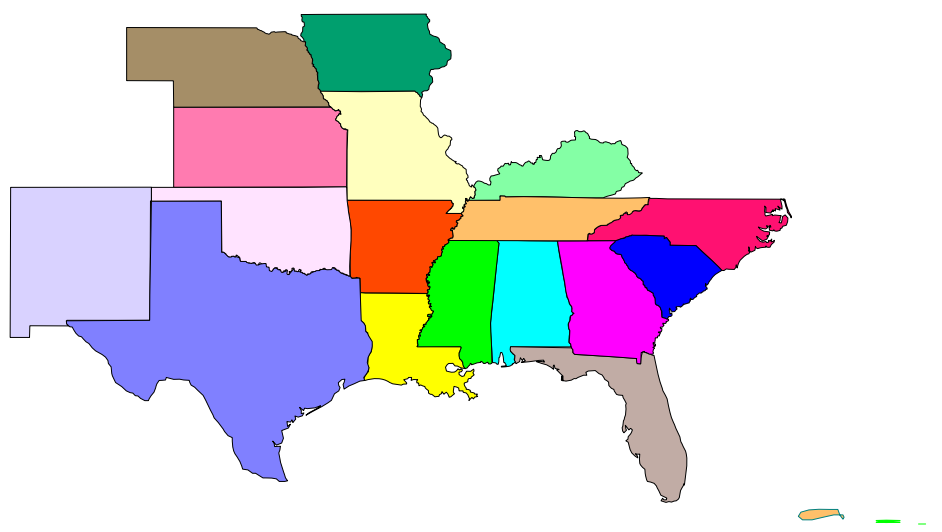


# **BYCATCH IN THE SOUTH ATLANTIC, GULF OF MEXICO, AND CARIBBEAN**



**SOUTHEAST BYCATCH WORKSHOP PROCEEDINGS**  
**May 16-18, 2006**

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## SUMMARY

### Overall Summary

On May 16-18, 2006, NOAA's Southeast Regional Office hosted the Southeast Bycatch Workshop in St. Petersburg, Florida. Approximately 100 participants representing commercial and recreational fishermen, non-governmental organizations, scientists, and managers attended the workshop. The goal of the workshop was to provide a better understanding of bycatch issues in the Southeast Region and identify potential solutions to reduce bycatch by means of management measures, gear technology, data/monitoring, and research. The first day of the three-day workshop consisted of a series of presentations to provide an overview of regional bycatch issues and potential solutions. On the second day, attendees divided into four working groups, including: science and research; data and monitoring; gear technology; and management, to address specific questions concerning bycatch and seek solutions to bycatch issues. On the last day, all workshop attendees reconvened for a working group panel report by the moderators.

A number of common themes were identified during the workshop. All workgroups stressed the need for more information on bycatch and bycatch mortality, landings, fishing effort, and more timely use of these data within the fishery management system. Many individuals felt increased at-sea observation is critical to successful management of various fisheries. However, workgroups indicated observer programs are very expensive and fishermen may operate differently in the presence of an observer. It was suggested NMFS develop and/or fund pilot projects, which examine incentives for vessels to pay to carry an observer. Workgroups also suggested greater emphasis should be placed on inexpensive means or alternate methods of monitoring bycatch. Methodologies of data collection including cooperative research, electronics (cameras, video, electronic logbook), paper logbook, retention of 100 percent of the catch, remote observation of vessels, aerial surveys and satellite imagery, stranding programs, and fishery independent methods could be used to augment or replace observer information. In particular, technology (e.g., VMS, video monitoring) was suggested as a way of augmenting observer programs and addressing whether fishermen behavior changes when observers are present. Bycatch information collected by technological means can help groundtruth data collected from observers or logbooks. Furthermore, logbook data are less expensive than observer data but may not provide sufficient detail. The strength of logbooks is the extent of fleet coverage they can provide. The workgroups determined no single method of bycatch estimation is perfect and not all methods are applicable to a fishery; therefore, the use of multiple methods will provide a clearer picture of the issue.

The timely collection and use of data (landings and bycatch) is a critical issue in the southeast region. There is a time lag between the last year of data used in a stock assessment and the year when management measures are implemented. While timely data collection and analyses is an important issue for the commercial and recreational sectors, it is a particularly difficult issue for the recreational sector, which relies on survey information and is currently being addressed in a national plan.

The magnitude of bycatch needs to be monitored so accurate estimates can be included in assessments. Allowable bycatch limits should be established. To ensure overfishing does not occur and overfished species are allowed to rebuild, harvested individuals and bycatch should both be monitored. The ultimate goal would be to monitor bycatch and catch in-season to ensure total mortality remains within appropriate limits and overfishing does not occur. By managing total mortality, fishermen would have an incentive to maximize landings and minimize bycatch.

Another common theme was the need to involve industry in identifying solutions to reducing bycatch. Cooperative research programs were strongly supported by the four workgroups. Cooperative research between scientists and industry promotes outreach, education, and acceptance of reasonable ways to reduce bycatch. The workgroups stated scientists need to be an integral part of the design of cooperative research programs, while relying on industry's expertise. Furthermore, there is a need for long-term cooperative research projects.

Several workgroups stated incentives and accountability measures should be created for industry to develop ways to reduce or avoid bycatch. For example, one workgroup suggested an effort level could be established for shrimpers. An incentive for maintaining the level of effort could be the elimination of bycatch reduction devices (BRD's). However, if shrimpers wanted to fish in a "hot spot" area they would have to use a BRD, carry an observer, and or employ the use of VMS. Penalties for high bycatch levels might be appropriate. Sectors, which fail to reduce bycatch, could be held accountable through lower catch levels. Workgroups endorsed these type of incentives and suggested managers could consider a set aside, which would reward good performance with extra quotas

The participants of the workshop concluded bycatch is a concern for all stakeholders and resource users and these individuals need to work together to determine better ways to measure and address bycatch. All four workgroups stated outreach, education, and communication needs to be enhanced. The different workgroups proposed various ways to meet this goal. One group suggested an education program is needed which uses the best media to get information out to all members of the public. Several groups pointed out language and cultural differences need to be considered when communicating bycatch issues with the public. In any education program, methods to reduce bycatch should be promoted. Furthermore, industry should do more to promote their successes in bycatch reduction. Outreach and education can promote trust between government and industry. Better communication will enable solutions to bycatch and build trust between the different users. Newsletters, bulletins, and radio announcements are excellent means of communication, but personal contact is the most important tool for fostering buy-in. Outreach, no matter what form, should be constant and consistent.

## Management Workgroup Summary

### **Moderator: Vince O'Shea**

The members of the Management Panel addressed bycatch issues associated with four questions. The Panel also identified possible solutions to these issues. Specific responses to these questions by the panel and issues discussed by the workgroup are listed in the [Appendix](#). The four questions posed to the panel were:

1. What are the most difficult bycatch issues in the Gulf of Mexico, South Atlantic, and Caribbean?
2. Is there general agreement about bycatch problems and issues? If not, why?
3. What are potential solutions to the region's major bycatch problems?
4. How can we promote increased cooperation and collaboration in defining and resolving the region's bycatch problems?

Red snapper bycatch was identified as the most significant bycatch issue in the Southeast Region. Currently, Bycatch Reduction Devices (BRDs) are providing less reduction than was originally expected and is currently needed. The panel determined a more effective BRD is needed and placement of BRD in the net is critical. However, it is unlikely technology alone will solve the red snapper bycatch problem.

Reducing effort in the shrimp industry would reduce bycatch as well as increase profit. Overcapacity in the shrimp industry is a problem in the Gulf of Mexico despite hurricanes which destroyed much of the infrastructure. Studies are needed to determine the true magnitude of effort in the shrimp industry. Red snapper bycatch is also occurring in the recreational fishery. The magnitude of this impact on the stock is not very well quantified but it could be very large. Creation of low relief habitats and studies of these habitats might help reduce bycatch. Therefore, there are a number of interconnected ways bycatch of red snapper can be reduced. Bycatch goals need to be established and through cooperative studies with industry and scientists, methods to reduce bycatch of red snapper can be identified. Industry participation is very important. The development of incentives for industry would likely go far in the development of means to reducing bycatch.

Managing multispecies complexes is very problematic and the workgroup cited examples of difficulties experienced with red grouper and gag in the Gulf of Mexico. The Workgroup concluded there is a need to balance the harvesting of strong stocks versus weak stocks and ensure the weakest link is protected. Size limits are used in management of recreational and commercial fisheries and result in bycatch. The group felt estimates of bycatch, which are poorly known, need to be incorporated into stock assessments and management decisions. Furthermore, more needs to be known about species-specific depth related release mortality rates. These types of data are crucial in determining the utility of size limits.

To better identify the universe (number and demographics) of saltwater anglers, and to facilitate future surveys of anglers (more efficient contacts and better effort and catch data, in general), the National Research Council (NRC) in their review of the Marine Recreational Fisheries Statistics

Survey (MRFSS) survey, recommended licensing of every single recreational angler. The group felt if the universe of recreational fishermen identified more precisely, as recommended by the NRC, estimates of the magnitude of bycatch could be enhanced. A mandatory saltwater license would also be beneficial in identifying the number of recreational fishermen. There is too much reliance on self-reporting, which can provide a very biased view of the data. Education would help mitigate some of the problem. A higher percentage of observers on boats would help ground-truth self-reported data. Accurate bycatch data needs to be collected on recreational trips to support stock assessments. Furthermore, it might be advantageous to have individuals collect data without the knowledge of other fishermen since the presence of observers can change behavior.

The panel concluded there is a need for improved data and better data leads to better solutions. Furthermore, stakeholders need to be involved, and communication and education should be enhanced. A strategic plan for bycatch reduction should be developed by setting out goals, and identifying where we want to be in 5 years.

### **Facilitated Discussions:**

During the facilitated discussions, the workgroup attempted to identify specific concrete actions which could be used to reduce bycatch considering current budget and management restraints.

The workgroup felt there was a need to increase the credibility of data, especially Marine Recreational Fisheries Statistics Survey (MRFSS). Furthermore, more funds are needed for research and observer programs. The value of the recreational and commercial fisheries is huge but few funds are available for research and observer programs. Cooperative research between science and industry is needed.

If the recreational mortality is significant then a limit on it would be a potential management tool. However, we are currently far away from being able to monitor bycatch in any fishery. End of season results and averages over a few years can be used to adjust allowable catch. Incentives and/or penalties could be used to reduce bycatch. For example managers could set an effort level for shrimpers. As an incentive, they would not have to use BRDs. However, if shrimpers went into a hot spot area they would have to use a BRD, carry an observer, and or employ the use of VMS. The workgroup endorsed these kind of incentives and suggested managers could consider a set aside that would reward good performance with extra quotas.

An education program is needed. In this program, the best media should be used to get information out to all members of the public. There are language and cultural barriers in communicating bycatch issues to the public and developing an outreach strategy. In an education program, methods to reduce bycatch must be promoted. Industry could and should do more to promote their successes in bycatch reduction. Cooperative research between scientists and industry promotes education. There is a lack of trust in the government. This can be remedied through outreach and education.

The existing strategic plan for reducing bycatch needs input from all users including stakeholders, councils, and commissions. The plan should establish a system to measure bycatch, set standards, and identify a means to track those standards. The plan should look at all



of the agencies' strategic plans and add to what exists. Bycatch is addressed in all of them. If the stakeholders do not participate in developing solutions then they will have solutions forced upon them. Protected species and bycatch issues in reef fish and shrimp are priorities. Data need to be quantified and observer coverage is needed.

## Science and Workgroup Management Workgroup Summary

### **Moderator: Joe Powers**

The panelists began by discussing the major bycatch issues. During this discussion, panelists and members of the audience were given an opportunity to speak and state what they believed were important science and research bycatch issues that should be addressed during the afternoon session. Specific responses to these questions by the panel and issues discussed by the workgroup are listed in the [Appendix](#). Some of the major points were:

- Bycatch directly affects fishermen through regulations; it is important to understand how bycatch impacts fisheries and fishery management;
- Need to separate science from policy and management when designing research surveys;
- Data sets need to be fishery dependent; fishery independent surveys involve too much extrapolation;
- Need to discuss what tools exist for collecting data and balance those with what tools already exist;
- Need better spatial data with regard to bycatch;
- Evaluate how the relative abundance/ species composition of many species has changed as a result of shrimp trawl bycatch;
- Determine what species have become dependent on bycatch;
- Evaluate the impact of pouring benthic productivity through water column;
- Are we promoting interactions with fishing gear with some of our management programs?;
- Need to get back to the basics of the science and work through some of the prejudice and agendas people might have. Need to determine impact of bycatch and how it fits into overall ecosystem. Need to look at predator-prey relationships relative to human component;
- Need to measure bycatch – how much is there, size and age of animals. Good sampling designs are needed to obtain information on bycatch. What species are we concerned with? For rare species, estimation is difficult. For more abundant species, bycatch is more easily estimated. Need good estimates of mortality rates;
- Estimation of released fish by the MRFSS is unreliable and most bycatch from recreational anglers are regulatory discards. Need to get a handle on discard mortality and appropriate estimation of total bycatch. Need to determine the impact of bottlenose dolphins on bycatch;
- Need to determine how science can assist management component and address what managers need. Observer programs are often developed ad hoc and often waste a lot of time because data collected doesn't assist in addressing necessary questions;
- Interested in how science and research can assist management, which has created many of our fishery bycatch problems through regulations.

After the initial opening remarks by each of the panelists and audience members, the panel then was asked to respond to four guiding questions. These guiding questions were developed by the Bycatch Workshop Steering Committee prior to the meeting and were

intended to focus the panel's discussion with regard to science and research. The four guiding questions were:

1. What are the key science issues with respect to bycatch issues in the Gulf of Mexico, South Atlantic, and Caribbean? For fish? For protected species?
2. What data are needed to resolve these issues?
3. How can we most effectively develop bycatch monitoring programs that address stock assessment, fishery management, and protected species requirements in an integrated fashion?
4. How can we most effectively develop cooperative research programs for assessing impacts of bycatch on marine ecosystems?

The panel agreed that questions 3 and 4 were similar and therefore they combined these questions for discussion.

It was suggested the discussion be within an ecosystem framework. The panel recognized management was based on single species, but practical advice and recommendations should be given for the future, which is moving toward more ecosystem based management approaches. There is a need to consider interactions with the ecosystem. From a management perspective bycatch is important; however, from a science perspective it is only one element of mortality. To further frame the discussion, the following question was posed: from an ecosystem perspective: Does bycatch accomplish its purpose? It was discussed bycatch allows predators to expend less energy to feed, resulting in energetic changes. Bycatch in most fisheries is not measured well and it is difficult to assess the transfer of energy through the ecosystem when bycatch is poorly measured. Managers are heading toward ecosystem management, but there is a great need to determine ways to conduct studies to reduce bycatch mortality for each gear used, for each species, and for each way gear are used. Without this information, managers will not be able to do ecosystem-based management.

The panel discussed whether it is more important to design science and research as a way to understand the ecosystem to better understand bycatch or was understanding bycatch most important for leading to ecosystem based management. In response to the question, it was pointed out that one was a bottom up approach, whereas the other was a top down approach and that scientists were more likely to do more bottom up science and research. The panel determined the ecosystem approach was useful for informing managers and scientists of data needs.

During discussion of data needs the issue of sampling design was discussed, as well as the need for discard mortality estimates. A panelist proposed prioritizing data needs based on information needed for stock assessments. It was agreed information on bycatch quantity and discard mortality by depth were important data needs. With respect to the shrimp fishery, adequate sample sizes are needed and greater scientific rigor is needed for properly collecting data. More predation data on discards should be collected. Protected species interactions, especially dolphin predation on bycatch, were noted as an increasing problem and as stocks rebuild interactions with protected species will increase.

It was recommended more research be conducted under industry conditions, rather than controlled conditions. The panel discussed differences in how fishermen behave with and without observers. The use of technology (e.g., VMS, video monitoring) was suggested as a way of addressing whether fishermen behavior changes when observers are present. It was also suggested a standard protocol for addressing bycatch data collection be developed; the protocol could guide managers/scientists in determining what are the most important data needs with regard to bycatch. However, just because there is a standardized data collection form doesn't mean the correct questions are being asked. Scientists and managers should carefully consider which questions are appropriate and which data sources are needed/considered. This will allow managers and scientists to determine what is pragmatic and what is not.

Another data need discussed was depth specific catch/release information for the recreational fishery to determine where most fish are caught. Current sampling programs, such as MRFSS, are not collecting much bycatch information, such as quantity and size of discards. Currently, in the South Atlantic, NOAA Fisheries Service is placing observers on headboats to determine size composition and quantity of bycatch. The ACCSP could be used as a useful data collection model for the Southeast region. In response to the recent NRC's report on recreational fishing surveys, NOAA Fisheries Service is responding with an implementation plan for MRFSS to improve data collection. MRFSS needs better size and spatial distribution data.

Habitat limitation and compensatory mortality are important issues for addressing bycatch. Large spatial closures (no fishing) in relation to control, open-access fishing areas could be used to conduct controlled experiments. More cooperative research should be conducted with industry to find ways to reduce bycatch.

From an economic perspective, data needs include: costs associated with handling bycatch; behavioral issues with bycatch; and conducting add-on economic data surveys. The panel discussed providing fishermen with incentives to reduce bycatch, and indicated incentives would be contingent on knowing something about the economic and social environment.

After the discussion of data needs, the panel addressed questions 3 and 4 collectively. The panel recognized the credibility of assessments would be improved by using data consistent with the observations of fishermen. Science panels should be used to identify research projects for fishermen and a formal process be created for defining issues to be addressed by cooperative research programs. Observers should be placed on vessels in which fish are not discarded to obtain size and age composition data. In the U.S. Virgin Islands, dockside samplers are collecting bycatch data from fishermen, who bring fish to the dock they normally would not retain.

The panel indicated there was poor communication between the government and stakeholders and there was poor internal communication within NOAA Fisheries Service. The panel discussed incentives and the need for fishermen buy-in when participating in cooperative research, with the end goal of better data regardless of whether or not the data benefit a fisherman from a management standpoint. Scientists need to be an integral part of the design of cooperative research programs, while relying on industry's expertise. There is a need for long-term projects; the 18-month grant program is too short. Often cooperative research proposals are

ad-hoc and are based on small spatial scales. Pilot programs are needed prior to implementing full bycatch monitoring programs. Procedures are needed to evaluate implementation of observer programs. Formal statistical analyses of sampling regime are needed for observer programs. Also, there is a need to create an incentive system, such as in the Pacific where there are excise taxes and bycatch quotas.

### **Facilitated Discussions:**

During the afternoon facilitated discussions, the workgroup's agenda was to:

1. Identify/agree on issues or problems in science and research. What are we missing?;
2. Identify/suggest solutions to address issues/problems; and,
3. Prioritize solutions given current resources.

The panel first discussed the issues and problems related to bycatch in science and research, then identified solutions to these issues and problems, before discussing how to create a more effective bycatch monitoring program.

The following issues, problems, and data needs were identified for science and research:

- Measurement of bycatch in all fisheries/fishing gear
  - Quantity
  - Quality (i.e., age and size composition, species composition – past and present)
- Discard mortality rates
  - Delayed mortality/long-term survivorship (predation)
  - Condition of discards when released
  - Fate of bycatch (i.e., assume 100% survivorship of fish that escape shrimp trawl BRDs)
- Effectiveness of bycatch reduction devices
  - Differences in controlled experiments versus actual fishery conditions
- Impacts
  - Benefit/fate of bycatch (bioenergetic flow)
  - Shifts in species composition/change in predator-prey relationships
  - Enhancement of tertiary predators, including protected and endangered species
  - Misattributed impacts due to other causes other than bycatch (i.e., habitat loss)
  - Effects of habitat on bycatch composition
  - Anthropogenic impacts (i.e., hypoxic zone)
  - Impacts due to bycatch versus impacts on bycatch composition due to other sources (anthropogenic alterations)
- Natural mortality – is there compensatory mortality? When does compensation occur, before or after bycatch.
- Social-economic/user impacts (i.e., additional fishery regulations)
  - Catch (CPUE) reductions (i.e., TEDs/BRDs as they relate to shrimp loss)
  - Regulatory impacts on costs and returns
  - Effects of changes in effort on the magnitude of bycatch

The following data were determined to be needed to address the problems/issues identified above:

- Measurement of bycatch
  - o Effort (have effort data for shrimp fishery) – scale of data important
  - o Catch-rates/documentation of interactions with protected species
  - o Baseline data – depth, geographic location, reporting grids, length, age, species composition, gear type)
- Discard mortality rates
  - o Condition of discards
  - o Long-term survivorship
- BRD effectiveness
  - o Condition and survivorship of excluded animals (unmeasured mortality) interacting with gear
  - o Basic understanding of sources of mortality (controlled experiments)
- Impacts
  - o Species composition of catch and survey
  - o Identify indicator species for each trophic level
  - o Economic/social cost-benefits
  - o Data for estimating economic impacts
  - o Data to examine economic importance/significance of bycatch
- Natural Mortality
  - o Abundance and age composition in closed areas
- Anthropogenic impacts
  - o Habitat
  - o Productivity

The following solutions were identified for addressing the issues and data needs described above:

- Measurement
  - o Observation programs for catch, effort, and discards (at-sea, dockside if full catch landed, technological)
  - o 100% mandatory discard logbooks/logbook coverage (commercial, for-hire); subsampling of logbooks for specific issues; subsample private/rental sector
  - o Universe of registered/licensed recreational anglers
  - o Statistically designed sampling programs
- Discard Mortality Rates
  - o Outreach programs (expand)
  - o Observation programs
  - o Document predator interactions/occurrence/presence
  - o Tagging/pen holding/hyperbaric studies
- Impacts
  - o Monitor species composition of catches and surveys
  - o Identify and monitor indicator species by trophic level
  - o 100% logbook coverage for economic add-ons (commercial, for-hire)

- o Data rescue and re-analysis (historical overview)
  - o Specialized economic survey to examine significance of bycatch
  - o Assessment of regulatory action (economic and biological – short and long-term)
- Natural Mortality
  - o Monitoring abundance and age composition in large area closures (i.e., tagging)
- Anthropogenic Impacts
  - o Data mining (i.e., quantifying loss of habitat)
  - o Quantifying current habitat, development, increases in the hypoxic zone

The panel ended with a discussion of how to create an effective bycatch monitoring program. The following ideas were suggested to improve bycatch monitoring:

- Outreach/education – disseminate results of research grants via educational pamphlets, other materials
- Stakeholder workshops to discuss research/scientific needs
- Increase outreach/information for participating in Cooperative Research Programs (CRP)
- Streamline regulatory permitting process relative to CRP
- Develop technological applications of ocean observing systems
- Improve and broaden science panel to identify bycatch RFP

## Gear Technology Workgroup Summary

### **Moderator: Dave Medici**

During the morning session, the members of the Gear Technology Panel addressed bycatch issues associated with the following questions:

1. What recreational fisheries, commercial fisheries, and gear pose the greatest bycatch issues in the Southeast?
2. How can we build a better information bridge between researchers and fishermen?

Specific responses to these questions by the panel and issues discussed by the workgroup are listed in the [Appendix](#). The panel identified gear types as being set, tended, or mobile. Set gear include traps and pots. Principal problems associated with this gear are ghost fishing, self-baiting, entanglement in buoy lines, and damage to the bottom during haul back. Most fisheries require escape vents and degradable panels to minimize ghost fishing. Size, shape, color, twine type, and location of trap entrances are important for species and size selectivity. Weak links and bridal design can minimize the possibility of entanglements with protected resources. Trap loss is inevitable, particularly in the Southeast where tropical storms are frequent. Several states have derelict trap removal programs.

Gillnets can also be considered set gear; however, in many fisheries they are being fished as a tended gear. This gear is used to harvest sharks, king mackerel, Spanish mackerel, whiting, and other inshore species of fishes. Gillnets can be very size selective, and if tended, were felt to have little bycatch. A right whale take did occur recently from a shark gillnet. However, a participant in the fishery and protected resources representatives felt this take occurred through illegal practices and the whale would not have been caught if fished legally. Problems with gillnets for protected resources are primarily with buoys and lines. Methods to minimize bycatch include low-profile nets, weak areas in nets (blow-through), pincers (species specific for porpoises and turtles), and use of more selective gear (e.g., the use of strike-nets rather than set or tended nets). Work is currently underway in Pamlico Sound, N.C., using low-profile nets as a method to reduce turtle interactions. Several states have eliminated or curtailed gillnets in their waters due to protected resource issues.

Longlines are a set gear. In the South Atlantic and the Gulf of Mexico, longline gear has been moved to deeper waters. However, discard mortality is a problem when longlines are fished in deep water because survival of released fishes is a function of depth. Longlines (when being set) and trolling gear can also catch seabirds.

Hook-and-line gear is a tended gear. Most bycatch mortality is from fish brought up from depth (barotraumas). Bycatch is hard to manage because little information is available. In some fisheries (e.g., red snapper), research has shown discard mortality has been underestimated. Predation from dolphins, birds, and sharks is a significant source of mortality for discarded fishes. Using circle hooks, decoders, and specific kinds of bait can reduce mortality. Gear such as fish “descenders” and cages should be examined as methods to minimize discard mortality.



For some fisheries, particularly those operating in mid-shelf and deep waters, consideration should be directed at reducing or eliminating minimum size limits to reduce regulatory discards.

Trawls are a mobile gear. Bycatch with this gear type can be significant. In addition to shrimp, trawls are used to harvest calico scallops and jellyfish. These latter two fisheries are not extensive and currently don't use turtle excluder devices (TEDs) or bycatch reduction devices (BRDs). TEDs, while protecting small turtles, initially were too small and so did not protect larger sea turtles. Thus, larger TEDs were introduced. TED development has expanded to other fisheries. BRDs were initially developed to reduce red snapper bycatch, but designs and testing protocols are moving away from species-specific devices. BRDs are a good example of why gear and protocols should be reexamined. Fisheye BRDs became less effective as fishermen changed how they retrieved their gear to minimize shrimp loss. One panel member would like to see the Andrews TED revisited as a BRD. It was effective at eliminating bycatch; however, another panel member indicated the Andrews TED became less effective as a TED when the webbing aged.

Some panel members were concerned about gear selectivity. Most gear types have been developed to harvest the largest, most fecund fish. In the past, these fish may have been protected by living in harder-to-fish habitats. However, as gear technology has advanced, few habitats are free from fishing. Other management measures such as protected areas or size-selective gear that precludes the harvest of larger fish may be necessary to minimize fishing mortality of large spawners.

With regard to building a better information bridge between researchers and fishermen, some panel members thought formal meetings end up having little interaction between managers and stakeholders. Sea Grant was identified a good organization to disseminate information. Other mechanisms included gear demonstrations, videos, fishing television shows, fishing clinics, and working with organizations such as the Outdoor Writers Association. School-based programs instilling good fishing ethics in children was thought to be a good way to get parents to change their behaviors (i.e., a bottom-up technique). For some communities, language was seen as an information barrier.

One panel member suggested an incentive-based continuing education program for commercial and for-hire fishermen would be beneficial. It could be structured similar to programs for farmers and construction workers who earn credits to use certain products or equipment. For the fishing industry, credits could be earned to maintain a vessel permit or operator's license.

Cooperative research programs between investigators and industry are becoming more common. Funding was cited as the most limiting factor for these research programs. For fisheries where fees are charged, making sure most of the funds are channeled back into the fishery is important, as has been done in the Northeast. Industry is more likely to get behind methodologies if they feel they have had a role and a financial stake in its development.

### **Facilitated Discussions:**

During the afternoon facilitated discussion, the panel and audience conducted a brainstorming session to identify mechanisms that could help to mitigate the effect of bycatch. The three areas

discussed included gear technology, transfer of technology, and gear implementation. Gear technology items (ranked in order of importance) were as follows:

#### GEAR TECHNOLOGY:

- Handling of bycatch species (venting, release at depth, hook removal, retrieval speed, predation)
- Gear research approved as scientific
- General permit for research (take allotment for PR with research) under a programmatic Section 7 set aside for research
- Conditional certification
- Trawl design
- Low impact mobile design
- Hopper systems (deck sorter)
- Peer review of industry research
- More transparent research
- Allow research from commercial vessels
- Exempt scientific research from commercial regulations
- Increased survival
- Revisit gear designs by industry

In the process of developing this list, several points were made including difficulties in conducting research. Current procedures to obtain research permits make it difficult for the commercial industry to test gear. Much of the problem lies with the definition of scientific research and scientific research vessels. Additionally, if the gear testing involves protected resources, there is an added layer of bureaucracy. This was evident in the difficulties North Carolina researchers were having getting permits for a gillnet study. Finally, it was noted that gear, once certified, should periodically be revisited to ensure the gear is working as expected.

The Panel and audience then brainstormed on how technology and information could be transferred to stakeholders. The following list, in no particular order, was developed.

#### TRANSFER OF TECHNOLOGY:

- Traditional local workshops
- Result and method demonstrations
- Local contact
- NGO presentations
- Small group waterfront contacts
- Videos
- Publications
- Newsletters
- Webpages
- Outdoor writer's associations
- Newspaper/fishing periodical articles
- Elementary/youth education
- Incentives to use gear

- Continuing education linked to permitting
- Extension-based gear workshop
- Annual publication
- Listserv on bycatch gear

The Panel and audience brainstormed on how to implement new bycatch technologies. The list, in order of importance by the group, was as follows:

#### GEAR IMPLEMENTATION:

- Create a NOAA Fisheries Service bycatch coordinator position
- Saltonstall-Kennedy funds to be spent on bycatch gear development
- Fishery development (utilization) of bycatch species
- NOAA Fisheries Service annual or more regular report on National Standard 9 with chapter on gear technology

Finally, the Panel and audience discussed the timeline needed to implement bycatch reduction gear. Some gear has already been developed, but little or no action has been taken. The group identified gear that presently could be implemented in regulations including circle hooks, venting tools, de-hookers, and barbless hooks. Research on low-profile gillnets in North Carolina was in year three of a three-year program, and so could be implemented in the near future if shown feasible. Over the long term, research should be directed at webbing/net design for trawls, hoppers (deck sorters) for trawl fisheries, and the development of cages or other mechanisms to assist fish to descend to depth while avoiding predation.

Although the shrimp trawl fishery topped the list, the Panel decided to leave discussions of this fishery for last because there have been many studies on BRDs developed for this fishery.

## Data and Monitoring Workgroup Summary

The members of the Data and Monitoring Panel addressed bycatch issues associated with seven questions. Additional questions were addressed during the afternoon facilitated session. Specific responses to these questions by the panel and issues discussed by the workgroup are listed in the [Appendix](#). The workgroup attempted to identify issues and solutions for each question.

### **Moderator: Vicki Cornish**

#### Questions:

1. Which fisheries are most lacking in information regarding bycatch in the Gulf of Mexico, South Atlantic, and Caribbean? For fish? For protected species?
2. What are the strengths and weaknesses of various methods of estimation of bycatch, including consideration of observer programs, self-reporting, and alternative approaches? How can we improve the performance of each?
3. What are the most effective approaches to increase precision and minimize bias in estimation of bycatch?
4. Faced with limited resources, how best can NMFS prioritize data needs?
5. What can we learn/apply from other regions that are successfully dealing with bycatch? How can we best communicate results of monitoring to stakeholders?
6. Are there some fisheries that lend themselves to monitoring using one approach or another?
7. How can we most effectively develop bycatch monitoring programs that address multiple objectives of stock assessment, fishery management, and protected species requirements in an integrated fashion?

Fisheries in the Gulf of Mexico often lack data on fisheries prosecuted in the Exclusive Economic Zone (EEZ) and state waters. There was a consensus among the workgroup that effort in state waters is often under-represented. This concern is particularly true of the shrimp fishery. Additionally, in the reef fish and mackerel fisheries only 20 percent of fishermen report discards. The South Atlantic needs updated information for a number of fisheries including shrimp, which was last done in 1993. In Puerto Rico and the Virgin Islands fishermen claim they experience very little bycatch because most fishermen retain everything landed, even those species not targeted to use as bait or for personal use. Additionally, many fishermen in Puerto Rico and the Virgin Islands see data collection by regulatory agencies as a way for agencies to impose further management restrictions.

In the recreational fishery there are a number of concerns. There is currently no monitoring in the Caribbean of recreational activity. Puerto Rico has some recreational fishing data but the quality and sample size is poor. For all recreational fisheries there is limited coverage and little data concerning interactions with non-fish species, including marine mammals, turtles, and seabirds.

Observer programs provide very accurate data including bycatch composition and effort. However, observer programs may experience bias in both voluntary and mandatory programs. Voluntary programs lend themselves to non-representative sampling of the fleet. Mandatory

observation programs may experience the effects of altered fishing behavior by fishermen who do not want observers on-board. Observer coverage is also very cost prohibitive, and often times it is impossible to get adequate coverage (though 100 percent coverage may be overkill in some fisheries). Logbooks may not provide sufficient detail since fishermen may not provide some information. Additionally, self-reporting (as with logbooks) requires a comprehensive education program, and should include incentives, not disincentives. The strength of logbooks is the coverage of the fleet they provide (often times 100%).

The key to estimating bycatch is to use multiple data collection methods specific to the targeted fishery. No one method of estimation is perfect and not all methods are applicable to a fishery, therefore the use of multiple methods will provide a clearer picture of the issue. Other methodologies of data collection include: cooperative research, electronic methods (cameras and video), retention of 100 percent of the catch, remote observation vessels, aerial surveys and satellite imagery, stranding programs, and fishery independent methods.

Precision can be improved by increasing sampling size and frequency, but at significant cost with diminishing returns. Data sets should include some measurement of the precision, so when it is used by others, they know how reliable the data are. Bias can be minimized through good sampling design, which includes: A priori info about the system; pilot studies; identifying the universe of fishermen; defining the fishery, initially over-stratify the sampling; sample in representative seasons and areas. Specifically, logbooks can be less biased by requiring 100 percent reporting on a frequent basis, and education programs. Observer data can be less biased by using mandatory observer programs with random selection of vessels, and debriefing of observers immediately after the collection process. Also, it is important to involve the data collectors in the analysis.

In the recreational sector, a small subset of fishermen could be educated on how to identify and quantify discards. A recreational license is crucial to measure the number of fishermen to better understand the sampling frame of this sector, as well as assisting in refinement of the MRFSS effort estimates.

There needs to be a documented and justified mechanism for setting priorities with a regular independent review of the program to ensure primary objectives are being met. Each fishery should be examined independently to assess its needs. Input from stakeholders including biologists, managers, and fishermen should be incorporated in the prioritization of data needs. A national bycatch board would help ensure consistent funding and consistent priorities by using a ranking process to justify funding decisions and requests.

Collaboration is the key lesson from other regions. At a very minimum there should be collaboration within NMFS between regions. Ideally, there would be interagency collaboration as well as collaboration with States, NGOs, and other stakeholders. There should be an enhanced working relationship with SeaGrant and the National Ocean Service. Additionally, NMFS Fisheries Information System should take a lead role in fostering collaboration. To foster this collaboration, methodologies should be consistent from one region to another. Finally, there should be a good plan, which will foster buy-in on priorities.

Communication of results of monitoring should be approached in a number of different ways. There should be query-driven public websites. Newsletters, bulletins, and radio announcements are excellent means for outreach, but personal contact is the most important tool for fostering buy-in. Outreach, no matter what form, should be consistent and never ending.

There is a need to work cooperatively with all state and federal agencies, NGOs, and recreational fishing organizations. As part of this cooperation, information should be provided on existing data collection programs and who or what agency is collecting the information. Using standardized common elements facilitates integration of the data.

## SPEAKER ABSTRACTS AND PRESENTATIONS

### INTRODUCTION, WORKSHOP PURPOSE, AND GOAL

**Roy E. Crabtree**

Regional Administrator  
NOAA Fisheries Service, SERO

#### ABSTRACT

NOAA Fisheries Service, Southeast Region, is responsible for the conservation, management, and protection of marine resources and their habitat in the Exclusive Economic Zone (EEZ) of the Southeastern United States. The Southeast Region works cooperatively with three regional fishery management councils and two interstate marine fisheries commissions: South Atlantic Fishery Management Council; Gulf of Mexico Fishery Management Council; Caribbean Fishery Management Council; Atlantic States Marine Fisheries Commission; and the Gulf States Marine Fisheries Commission. In combination, these Councils, Commissions, and NOAA Fisheries Service currently have over 20 different fishery management plans, many of which manage diverse species complexes such as reef fish or corals as a unit.

Fisheries in the Southeast generate about 850 million dollars in ex-vessel revenue each year. These fisheries reflect the diverse fauna of the region, with relatively few large fisheries and many small fisheries. The shrimp and menhaden fisheries dominate landings economically. Recreational fishing is a substantial part of the harvest in the Southeast Region. Participation in recreational fishing is much greater in the Southeast than other regions in the U.S.

Among many other legal mandates, NOAA Fisheries is required to address bycatch of organisms impacted by fisheries including protected species. Partnerships with other fishery management agencies and non-governmental organizations, including state fishery management agencies, interstate marine fisheries commissions, state Sea Grant College programs, commercial and recreational fishermen, the Gulf and South Atlantic Fisheries Foundation, Take Reduction Teams, and environmental organizations have been and continue to be crucial to addressing bycatch issues.

The purpose of this workshop is to obtain input from this diverse group of participants to share a wide range of knowledge, perspectives, and experience in bycatch issues. Through group participation, I hope, collectively, we can identify potential solutions to these issues by means of management measures, gear technology, data/monitoring, and research. Only working together through industry, science, management, and non-governmental organizations can we move forward.

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## SPEAKER ABSTRACTS

### NATIONAL BYCATCH STRATEGY

**Vicki Cornish**

Chief, Marine Mammal Branch, Protected Resources Division  
NOAA Fisheries Service, SERO

#### ABSTRACT

NOAA Fisheries Service launched the National Bycatch Strategy in March 2003, in response to the continued fisheries management challenge posed by fisheries bycatch. Bycatch is defined, by agency policy, as “the discarded catch of any living marine resource due to a direct encounter with fishing gear.” NOAA Fisheries Service has several mandates that direct the agency to reduce bycatch of both fish and protected species (sea turtles, marine mammals, and sea birds), including the Magnuson-Steven Fishery Conservation and Management Act (MSFCMA), the Endangered Species Act, and the Marine Mammal Protection Act. NOAA Fisheries Service identified a number of high priority needs for reducing bycatch of fish and protected species through gear technology and research in its 1998 report “Managing the Nation’s Bycatch.” However, efforts to implement the recommendations of the report stalled. In 2002, NOAA Fisheries Service was petitioned to undertake rulemaking to “count, cap, and control” bycatch. The National Bycatch Strategy was developed as part of the agency’s response to the petition, and addresses not only bycatch of fish and sea turtles, as mandated by the MSFCMA, but also marine mammals and seabirds. The National Bycatch Strategy includes the following 6 components: 1) assess progress in reducing bycatch, 2) develop and approach to standardized bycatch reporting methodology, 3) develop regional bycatch implementation plans, 4) undertake education and outreach, 5) develop new international approaches to bycatch reduction, and 6) identify new funding requirements. NOAA Fisheries Service has made significant progress in implementing the National Bycatch Strategy since 2003. Regional bycatch plans have been developed and annual progress reports are posted on the agency’s bycatch website. The 2004 report “Evaluation Bycatch” outlined a protocol and precision goals for Standardized Bycatch Reporting Methodologies, with a priority for expanding observer coverage to meet precision goals and minimize bias in estimations of fishery bycatch. There has been considerable research, testing, and application of new gear technologies in longline, trawl, and gillnet fisheries. Significant progress has been made in transferring new gear technology to fisheries in other countries. New funding has been obtained for bycatch monitoring and gear research, and initiatives are underway to further expand funding opportunities. Through the National Bycatch Strategy, NOAA Fisheries Service and its partners are making steady progress in meeting the challenge of reducing bycatch in an effort to continue improving the status of marine fisheries.

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## SPEAKER ABSTRACTS

### BYCATCH IN SOUTHEAST FISHERIES

**James M. Nance**

Chief, Fishery Management Branch  
NOAA Fisheries Service, SEFSC

#### ABSTRACT

The Southeast fisheries (North Carolina to Texas and the U.S. Caribbean) generate about one billion dollars in ex-vessel gross revenues per year (NMFS 2001). Fisheries of the Southeast reflect the very diverse fauna of the region, with relatively few large fisheries and many small fisheries. The fisheries have catches from more than 200 stocks of fish and fishery resources. There are more than 40 unique commercial fisheries in the Southeast based on a combination of target species groups and gear.

Currently there are four long-term funded at sea-observer programs to document bycatch on these commercial fisheries. These programs include the shrimp trawl fishery, the pelagic longline fishery, the directed shark gillnet fishery, and the shark bottom longline fishery.

This talk will discuss the Southeast fisheries in general, provide specific information on the current at sea-observer programs being used to document bycatch, and provide some direction in the development of plan to monitor the other fisheries.

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## SPEAKER ABSTRACTS

### **REDUCTIONS AND CHANGES IN SHRIMP TRAWL FISHING EFFORT IN THE GULF OF MEXICO: ELB PROJECT**

**B.J. Gallaway**

*J.G. Cole*

L.R. Martin

LGL Ecological Research Associates, Inc.

*J.M. Nance*

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National Marine Fisheries Service

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#### ABSTRACT

Estimates of shrimp trawl effort have taken on new significance due to historical and emerging bycatch issues. Between 1978 and 2002, shrimp trawl fishing effort in the Gulf of Mexico averaged on the order of 200,000 nominal days fished. An electronic logbook (ELB) has been designed and tested that enables better estimates of effort than have been previously available. The results of preliminary studies using ELBs have shown that there is a systematic bias in landings allocations where mid-shelf landings are systematically overestimated and near-shore and deepwater landings are underestimated. CPUE is typically underestimated. Landings allocation and CPUE estimation problems are being addressed using the new ELB technology. In 2005, effort estimated using the ELB data has been reduced by 43% from the 2001-2003 benchmark effort value being used to evaluate shrimp trawl bycatch impacts on juvenile red snapper.

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## SPEAKER ABSTRACTS

### REMARKS ON BEHALF OF THE GULF AND SOUTH ATLANTIC FISHERIES FOUNDATION

**Bob Jones**

President

Gulf and South Atlantic Fisheries Foundation

#### ABSTRACT

There is no comparison between the southeastern shrimp industry of the 1980s,90s, and the remaining domestic shrimp industry of today. The Foundation has participated in gear research since its inception and suggests reexamination of soft teds as a way to reduce fish bycatch. Efforts are underway to further investigate and define the magnitude of shrimp bycatch including observers. Red snapper bycatch or regulatory discards have a significant but undetermined impact on the health of the red snapper resource. Until current, accurate data on the number of vessels fishing in the Gulf of Mexico is made, bycatch reduction in percentages or pounds will be difficult to achieve.

## SPEAKER ABSTRACTS

### BYCATCH ISSUES AND THE ATLANTIC STATES MARINE FISHERIES COMMISSION

**Vince O'Shea**

Executive Director

Atlantic States Marine Fisheries Commission

#### ABSTRACT

I intend to frame the policy issue of this topic through several concise quotes regarding by-catch/management challenges developed from previous workshops and studies. I will briefly describe several by-catch issues currently being dealt with by the Atlantic States Marine Fisheries Commission. I will conclude by framing the next steps for this workshop, by providing several examples of action steps suggested by previous workshops and studies.

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## SPEAKER ABSTRACTS

### **BYCATCH ISSUES IN SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL FMPS**

**Gregg T. Waugh**

Deputy Executive Director  
South Atlantic Fishery Management Council

#### ABSTRACT

The Magnuson-Steven's Act requires each Fishery Management Council to specify bycatch reporting requirements and management measures (regulations) that to the extent practicable minimize bycatch and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. This presentation will review the Act's requirements, review FMP requirements for collecting bycatch data, review the Atlantic Coastal Cooperative Statistics Program (ACCSP) Bycatch Module requirements, review estimates of bycatch in each FMP, and present the management regulations designed to minimize bycatch. In addition, future actions to address bycatch will be described.

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## SPEAKER ABSTRACTS

### BYCATCH ISSUES OF THE GULF OF MEXICO FISHERY MANAGEMENT COUNCIL

**Wayne Swingle**

Executive Director  
Gulf of Mexico Fishery Management Council

#### ABSTRACT

Bycatch is characterized by species and amount for the spiny lobster, stone crab, and shrimp fisheries. Regulatory discard levels are examined for major finfish stocks for recreational and commercial fisheries. Standardized bycatch reporting requirements are implemented for shrimp and reef fish fisheries.

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## SPEAKER ABSTRACTS

### BYCATCH, SEA GRANT AND PARTNERSHIPS

**Terry Smith**

NMFS liaison to Sea Grant  
National Sea Grant Office

#### ABSTRACT

Fisheries bycatch, along with capacity and allocation, are the 'big three' issues in fisheries management not only in the US but everywhere in the world. Thus, its not surprising that NOAA Fisheries Service, the Fishery Management Councils, Intrastate Fishery Management Commissions, and all state fishery agencies have been wrestling with the science, regulations, technology, education and politics of bycatch for some time. NOAA Sea Grant, as a NOAA partner, and as a network of researchers, communicators and outreach agents has been engaged in confronting the bycatch 'problem' as well.

The Sea Grant College Program is extremely diverse and consists of 30 'state' programs, involving 3,000 scientists, engineers, outreach experts, educators and students at more than 300 institutions. Sea Grant work is divided into topic or theme areas with one of the most important themes, 'Fisheries'. The fisheries theme team identifies priority areas for Sea Grant focus, among those, bycatch. As a result the contributions to understanding bycatch from Sea Grant are numerous and diverse, ranging from facilitating regional workshops, training observers in Alaska to monitor bycatch, to a large suite of individual bycatch-related research projects at network universities and colleges.

Because Sea Grant involves not only research, but communication (writers), education, and outreach (Sea Grant extension) there is great scope for not only advancement in understanding of how to best deal with the catch of non-targeted species, but also the ability to facilitate meetings, publish documents, educate the lay public, fishers and decision makers on bycatch issues and solutions, and to reach out to the local fishing community dockside and on the water.

Thus, the 'partnership' role of Sea Grant working with NMFS, the Councils, the Commissions and the interested public is extremely important and the basis for moving forward together dealing with the intractable bycatch problem in the Southeast and the rest of the US.

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## SPEAKER ABSTRACTS

### **BYCATCH ISSUES FOR RECREATIONAL FISHERIES**

**Carol A. Forthman**

American Sportsfishing Association

#### ABSTRACT

The approach to bycatch in recreational fisheries is fundamentally different from commercial fisheries. The similarity is that although anglers may target specific species, they cannot completely control the species caught or the size of the fish. Therefore, while many commercial techniques are aimed at avoiding bycatch of non-target species, the primary issue for the recreational angler is not avoiding the capture of unwanted fish, but how to improve the survival of fish after they are released. This means that the focus in sportfishing has been on methods that do less damage during the catch phase and that improve survival upon release. A number of these techniques have been developed and more are being evaluated. In addition, a cultural shift in the angling community has increased the catch and release practice in many fisheries. Continuing research and education efforts are needed to improve performance and angler acceptance of the catch and release concepts.

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## SPEAKER ABSTRACTS

### BYCATCH ISSUES IN THE NORTHEAST

**Ron Smolowitz**

Coonamesett Farm

#### ABSTRACT

The presentation is a summary of general bycatch issues identified at the northeast bycatch conference. This is followed by a review of ongoing gear research to mitigate some of the more significant bycatch problems in northeast fisheries.

[Powerpoint Presentation](#)

## FINAL GROUP REPORT PRESENTATIONS

MANAGEMENT WORKGROUP

[Powerpoint Presentation](#)

SCIENCE AND TECHNOLOGY WORKGROUP

[Powerpoint Presentation](#)

GEAR TECHNOLOGY WORKGROUP

[Powerpoint Presentation](#)

DATA AND MONITORING WORKGROUP

[Powerpoint Presentation](#)

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## APPENDIX - WORKGROUP DISCUSSIONS

### Management Workgroup

#### PANEL DISCUSSION

##### Question 1. What are the most difficult bycatch issues in the Gulf of Mexico, South Atlantic, and Caribbean?

- Red snapper bycatch is the most significant bycatch issue in the Southeast Region.
- BRDs in shrimp trawls are providing less reduction than needed for red snapper.
- We do not have any technology in place that reduces bycatch enough.
- Pond raised shrimp have had a negative effect on the industry.
- Shrimp effort studies are needed. Some reduction likely from hurricanes last year.
- Managing multispecies complexes is problematic.
- There is a need to balance the harvesting of strong stocks versus weak stocks. Must make sure that the weakest link is protected.
- Size limits used for management of recreational fisheries results in bycatch.
- Estimates of bycatch need to be incorporated into management decisions.
- More needs to be known about release mortality. This information is crucial to determine how useful size limits really are.
- The true magnitude of red snapper bycatch from the shrimp industry as well as the directed commercial and recreational fisheries is unknown.
- Predator prey relationships needs research, particularly regarding the impact of bycatch on forage species.
- Increased abundance of less desirable species could affect stock size of more sought after species.
- Furthermore, as stocks recover there could be an increasing bycatch problem.
- Conflicting Perceptions of Bycatch among users.

##### Question 2. Is there general agreement about bycatch problems and issues? If not, why?

- Yes. However, there were some differences of opinion about priorities and solutions.

##### Question 3: What are potential solutions to the region's major bycatch problems?

- Need to determine how much is the reduction in shrimp fishing effort going to give us as a savings in red snapper mortality. Changes in effort indicate that we may have reached our goal.
- Can reduce bycatch further through better technology.

- Technology alone will not solve the red snapper bycatch problem. There are tradeoffs:
  - Need to look at red snapper loss in terms of the unknown recreational impact;
  - Need to consider bycatch reduction from changes in effort;
  - a more effective BRD and placement of BRD in the net is critical
  - low relief habitat studies might help.
- In the Gulf of Mexico there is more shrimp effort than is needed.
- Overcapacity is a problem. Can reduce bycatch by reducing effort. This will increase profit. Effort should be optimized as a potential way to reduce bycatch. There is the question of who is in and who is out and who makes that decision. In developing goals it is important to take into account the loss of directed fisheries. Industry participation is key. Increase the possibility of coming up with solutions.
- Incentives should be created for industry to develop means of reducing bycatch.
- To determine the dimension of the recreational bycatch, the National Research Council (NRC) recommended licensing of every single recreational angler.
  - We need to identify the universe to provide a better handle on the magnitude of recreational bycatch.
  - Establish a mandatory saltwater license would help.
  - Data collection must be improved.
  - Good estimates of release mortality rates are needed.
- There is too much reliance on self reporting.
- Education would help mitigate some of the bycatch problem.
- A higher percentage of observers on boats is needed.
- Scientists might need to go out and do recreational trips themselves.
- Need to put some folks on the vessel that observe without being identified to reduce the observer effect.
- Catch & release has to do with stewardship and ethics. Recreational fishermen realize that if the stock is reduced there will be less opportunity to fish and catch fish.
- There has been a cultural shift away from keeping fish. However, many recreational fishermen probably do not realize that a released fish does not necessarily survive due to depth related trauma.
- Responsibility falls on industry to educate. If we determine that bycatch is so high that the fishery can't sustain the stock then we may have to shut down the fishery. It is important to stay focused on total mortality.
- Some combination of shrimp effort reduction, enhanced gear technology, and reduced effort in the directed fishery is needed to reduce red snapper bycatch in the Gulf of Mexico.

Question 4. How can we promote increased cooperation and collaboration in defining and resolving the region's bycatch problems?

- Stakeholders need to be fully engaged with the managers to develop solutions to bycatch.
- Efforts have been made to get industry involved but improvement is needed.

- Responses to these issues are grounded in changing behavior.
- Develop a strategic plan for bycatch reduction by setting out goals, identifying where we want to be in 5 years, and establishing a think tank that can get away from day to day management.

## WORKGROUP DISCUSSION

### Data

- Stakeholder confidence in data critical.
- Define baseline/standards for bycatch.
- Linkage: overcapacity and bycatch.
  - Shrimp effort and red snapper mortality.
  - Define optimum capacity for all sectors.
- Who pays for improvements?
- Recreational license (data, education, revenue).

### Science Based

- Critical to maintain credibility.
- Manage for total mortality.
  - Quantify release mortality.
  - Validate impacts of size limits.
- Consider biology of species/ marketability.
- Collaborate in defining acceptable risk.

### Incentives/Penalties

- Bycatch/total mortality limits.
- Reduced bycatch equals increased harvest.
- Allocate bycatch across sectors.
- Access to hot spots in return for:
  - BRDs
  - Observers
  - VMS

### Education/Outreach

- Tailor outreach to target audience.
- Critical to identify self interests.
- Stakeholders should promote bycatch achievements/advancements.
- Coordinated message increases credibility.
- Cooperative research promotes education.

### Technology/Other

- Improve BRD technology.
- Low relief artificial reef for red snapper.



- Regional Strategic Bycatch Plan.
  - Ensure stakeholder involvement.
  - Opportunity to set long-term goals.
- Cooperative research can link technology, management, stakeholders.
- What are key lessons learned from other regions?
- Other regions have struggled with these questions/issues.
- Some regions impose limits on bycatch and close directed fisheries when those limits are reached.
- Where stakeholders slow to respond, costly solutions imposed.

## Science and Research Workgroup

### PANEL DISCUSSION

Question 1. What are the key science issues with respect to bycatch issues in the Gulf of Mexico, South Atlantic, and Caribbean? For fish? For protected species?

- Quantity and quality of bycatch measurement
- Estimation of discard mortality rates
- Effectiveness of gears used to reduce bycatch
- Ecosystem effects of bycatch (e.g., predator-prey relationships)
- Impacts of bycatch versus impacts from other sources

Question 2. What data are needed to resolve these issues?

- Good sampling design to better estimate bycatch.
- Bycatch information for stock assessments.
- Information on bycatch quantity and discard mortality by depth.
- Sample size is not adequate to estimate bycatch in the shrimp fishery.
- More predation data on discards.
- Protected species interactions, especially dolphin predation on bycatch.
- More research should be conducted under industry conditions.
- Data to resolve issue of observer effect.
- The use of technology (e.g., VMS, video monitoring) was suggested as a way of addressing whether fishermen behavior changes when observers are present.
- A standard protocol for addressing bycatch data collection.
- Depth specific catch/release information for the recreational fishery.
- MRFSS needs better size and spatial distribution data.
- Large spatial closures (no fishing) in relation to control, open-access fishing areas be used to conduct controlled experiments.
- Cooperative research with industry.
- From an economic perspective, data needs included: costs issues with handling bycatch; behavioral issues with bycatch; and conducting add-on economic data surveys.
- Provide fishermen with incentives to reduce bycatch, and that incentives would be contingent on knowing something about the economic and social environment.

*Questions 3 and 4 were addressed together.*

Question 3. How can we most effectively develop bycatch monitoring programs that address stock assessment, fishery management, and protected species requirements in an integrated fashion?

Question 4. How can we most effectively develop cooperative research programs for assessing impacts of bycatch on marine ecosystems?

- Identify a mechanism to define cooperative research projects and then seek out fishermen/constituents to assist in the research.
- Scientists need to be an integral part of the design of CRP programs.
- Incentives are needed for fishermen buy-in when participating in CRPs.
- There should be long-term CRP projects
- Pilot programs are needed prior to implementing full bycatch monitoring programs.
- Procedures are needed to evaluate implementation of observer programs.
- Enhance communication between the government and stakeholders.

WORKSHOP DISCUSSION

Question 1. What are the key science issues with respect to bycatch issues in the Gulf of Mexico, South Atlantic, and Caribbean? For fish? For protected species?

- Measurement of bycatch in all fisheries
  - Quantity
  - Quality (length, age composition, species composition)
- Discard mortality rates
  - Long-term survivorship (predation)
  - Condition of discards
- BRD effectiveness (generic)
  - Controlled versus actual fishing conditions
- Impacts
  - Bioenergetic flow (fate of bycatch)
  - Shifts in species composition
- Enhancement to tertiary predation including endangered and protected species
  - Socio-economic/user impacts
  - Perceived impacts
  - Impact of habitat on bycatch composition
  - Anthropogenic impacts
- Impacts due to bycatch vs. impacts on bycatch composition due to other sources (i.e., anthropogenic alterations, natural mortality)
- Natural mortality (compensatory mortality)
- Socio-economic
  - Catch reductions (in shrimp TEDs)
  - Regulatory impacts on cost returns
  - Effects of changes in effort on magnitude of bycatch

Question 2. What data are needed to resolve these issues?

- Measurement
  - Effort and catch rate (interaction rate)

- Species age/length
- Depth and geographic location
- Physical conditions
- Gear type
- Discard mortality rates
  - Condition of discards
  - Long-term survivorship
- BRD effectiveness
  - Condition and survivorship of excluded fish (all TEDs and BRDs)
  - Basic understanding of sources of mortality (controlled experiments)
- Impacts
  - Species composition of catch and surveys
  - Identify indicator species for each trophic level
  - Socio-economic cost-benefits
  - Data for estimating economic impacts
  - Data needed to examine significance of bycatch
- Natural Mortality
  - Abundance and age composition in closed areas
- Anthropogenic Impacts
  - Habitat
  - Productivity

Question 3. How can we most effectively develop bycatch monitoring programs that address stock assessment, fishery management, and protected species requirements in an integrated fashion?

- Measurement
  - Observation programs
- At-sea, dockside, technological (catch and effort)
  - Discard logbooks
- 100% mandatory for commercial and for-hire
- Subsample for private recreational
- Subsampling of logbooks for specific issues
  - Universe of participants (recreational)
- Licensing, permitting, registration
  - Pilot program for special dockside sampling
  - Statistically designed sampling programs
- Discard mortality rates
  - Outreach programs expanded
  - Observation programs
  - Document predator occurrence
  - Tag, pen-holding, hyperbaric studies (i.e., controlled experiments)
- Impacts
  - Monitor species composition of catches and surveys
  - Identify and monitor indicator species by trophic level
  - 100% coverage of economic logbooks (commercial and for-hire)
  - Data rescue and reanalysis

- Specialized economic survey
- Assessment of regulatory actions (economic and biological – short and long-term)
- Natural Mortality
  - Monitoring abundance and age composition of closed areas (i.e., tagging)
  - BACI (Before After Controlled Impact)
- Anthropogenic Impacts
  - Data mining
  - Quantification of habitat
  - Track and quantify development
  - Quantify degradation

Question 4. How can we most effectively develop cooperative research programs for assessing impacts of bycatch on marine ecosystems?

- Outreach and education (any grant awarded - X% of money goes into educational materials)
- Incentives – Recreational and commercial fishermen participate in research to answer “How this going to benefit me?”
- Make process more user friendly to participate in cooperative research
- Streamline federal permitting process relative to cooperative research
- Develop technological applications of ocean observing systems
- Improve/broaden science panel to identify bycatch RFP

## Gear Technology Workgroup

### PANEL DISCUSSION

#### Question 1. What recreational fisheries, commercial fisheries, and gear pose the greatest bycatch issues in the Southeast?

- Principal problems associated with this traps and pots gear are ghost fishing, self-baiting, entanglement in buoy lines, and damage to the bottom during haul back.
- Most fisheries require escape vents and degradable panels to minimize ghost fishing. Size, shape, color, twine type, and location of trap entrances are important for species and size selectivity. Trap loss is inevitable, particularly in the Southeast where tropical storms are frequent. Several states have derelict trap removal programs.
- Problems with gillnets for protected resources are primarily with buoys and lines.
- Methods to minimize bycatch include low-profile nets, weak areas in nets (blow-throughs), pingers, and use of more selective gear (e.g., the use of strike-nets rather than set or tended nets).
- Discard mortality is a problem when longlines are fished in deep water because survival of released fishes is a function of depth.
- Most bycatch mortality with hook and line gear is from fish brought up from depth (barotrauma).
- Bycatch is hard to manage because little information is available.
- Using circle hooks, dehookers, and specific kinds of bait can reduce mortality.
- Gear such as fish “descenders” and cages should be examined as methods to minimize discard mortality.
- For some fisheries, particularly those operating in mid-shelf and deep waters, consideration should be directed at reducing or eliminating minimum size limits to reduce regulatory discards.
- Bycatch with trawl can be significant.
- BRDs are a good example of why gear and protocols should be reexamined. Fisheye BRDs became less effective as fishermen changed how they retrieved their gear to minimize shrimp loss.
- The Andrews TED should be revisited as a BRD. It was effective at eliminating bycatch; however, the Andrews TED may become less effective as a TED when the webbing aged.
- Most gear types have been developed to harvest the largest, most fecund fish. In the past, these fish may have been protected by living in harder-to-fish habitats.
- As gear technology has advanced, few habitats are free from fishing.
- Other management measures such as protected areas or size-selective gear that precludes the harvest of larger fish may be necessary to minimize fishing mortality of large spawners.

#### Question 2. How can we build a better information bridge between researchers and fishermen?

- Formal meetings often end up having little interaction between managers and stakeholders.
- Sea Grant was identified a good organization to disseminate information.
- Other mechanisms included gear demonstrations, videos, fishing television shows, fishing clinics, and working with organizations such as the Outdoor Writers Association.
- School-based programs instilling good fishing ethics in children was thought to be a good way to get parents to change their behaviors (i.e., a bottom-up technique).
- For some communities, language was seen as an information barrier.
- An incentive-based continuing education program for commercial and for-hire fishermen would be beneficial.
- For the fishing industry, credits could be earned to maintain a vessel permit or operator's license.
- Cooperative research programs between investigators and industry are becoming more common.
- Industry is more likely to get behind methodologies if they feel they have had a role and a financial stake in its development.

## WORKSHOP DISCUSSION

### Gear Technology

- Handling of bycatch species to reduce mortality (venting, release at depth, hook removal, retrieval speed, predation, hopper systems)
- Gear research approved as scientific research (streamline gear development process)
- Programmatic Section 7 set aside for gear research (take allotment for PR with research)
- Conditional certification of fishing gear to spawn further development – decertification over time
- Investigate alternative trawl designs
- Low impact mobile design
- Peer review of industry research

### Technology Transfer

- Traditional local workshops
- Result and method demonstrations
- Local contact
- NGO presentations
- Small group waterfront contacts
- Videos
- Publications
- Newsletters
- Webpages
- Outdoor writer's associations

- Newspaper/fishing periodical articles
- Elementary/youth education
- Incentives
- Continuing education linked to permitting
- Extension-based gear workshop
- Annual publication
- Listserv on bycatch gear

#### Implementation

- Agency coordinator: NOAA? NMFS?
- SK funds for development of gear research and technology transfer/education
- Fishery development (utilization) of bycatch species
- Regular report (annual or biennial) on National Std. 9 with chapter on gear technology

#### Tools to be Implemented

- Short Term
  - Circle Hooks
  - Venting tools
  - De-hookers
  - Barbless Hooks
- Mid Term
  - Low profile gillnets
- Long Term
  - Hoppers (Deck sorters)
  - Net/webbing design
  - Cages (returning fish to water column; reduce F)



## Data and Monitoring Workgroup

### PANEL DISCUSSION

Question 1. Which Fisheries are most lacking in information regarding bycatch in the Gulf of Mexico, South Atlantic, and Caribbean? For fish? For protected species?

- Fisheries in the Gulf of Mexico often lack data on fisheries that are prosecuted in both the EEZ and state waters.
- There is a consensus that the effort in state waters is often under-represented. This concern is particularly true of the shrimp fishery.
- In the reef fish and mackerel fisheries only 20 percent of fishermen report discards.
- The South Atlantic needs updated information for a number of fisheries including shrimp, which was last done in 1993.
- In Puerto Rico and the Virgin Islands fishermen claim they experience very little bycatch.
  - Most fishermen retain everything landed.
  - Most fishermen in Puerto Rico and the Virgin Islands are suspicious of data use.
- There is currently no monitoring in the Caribbean of recreational activity.
  - Puerto Rico has some recreational fishing data but the quality and sample size is poor.
  - For all recreational fisheries there is limited coverage and few data concerning interactions with non-fish species, including marine mammals, turtles, and seabirds.

Question 2. What are the strengths and weaknesses of various methods of estimation of bycatch, including consideration of observer programs, self-reporting, and alternative approaches? How can we improve the performance of each?

- Observer programs provide very accurate data including bycatch composition and effort.
- However, observer programs may experience bias in both voluntary and mandatory programs.
- Voluntary programs lend themselves to a non-representative sampling of the fleet.
- Mandatory observation programs may experience the effects of altered fishing behavior by fishermen who do not want observers on-board.
- Observer coverage is also very cost prohibitive, and often times it is impossible to get adequate coverage (though 100 percent coverage may be overkill in some fisheries).
- Logbooks may not provide sufficient detail such as sensitive information fishermen may not want others to know.
- Self-reporting (as with logbooks) requires a comprehensive education program, and should include incentives, not disincentives.

- The strength of logbooks is the coverage of the fleet they provide (often times 100%).
- The key to estimating bycatch is to use multiple data collection methods specific to the targeted fishery because no one method of estimation is perfect and not all methods are applicable to a fishery.
- Other methodologies of data collection include: cooperative research, electronic methods (cameras and video), retention of 100 percent of the catch, remote observation vessels, aerial surveys and satellite imagery, stranding programs, and fishery independent methods.

Question 3. What are the most effective approaches to increase precision and minimize bias in estimation of bycatch?

- Precision can always be improved by increasing sampling size and frequency, but at significant cost with diminishing returns.
- Data sets should include some measurement of the precision, so when it is used by others, they know how reliable the data are.
- Bias can be minimized through good sampling design, which includes:
  - A priori info about the system;
  - pilot studies;
  - identification of the universe;
  - defining the fishery;
  - stratify sampling; and
  - sample in representative seasons and areas.
- Logbooks can be less biased by requiring 100 percent reporting on a frequent basis, and education programs.
- Observer data can be less biased by using mandatory observer programs with random selection of vessels, and debriefing of observers immediately after the collection process.
- Involving data collectors in analysis will reduce bias.
- To reduce bias in the recreational sector:
  - a small subset of fishermen could be educated on how to identify and quantify discards; and
  - a recreational license is crucial to measure the number of fishermen to better understand the sampling frame of this sector, as well as assisting in refinement of the MRFSS effort estimates.

Question 4. Faced with limited resources, how best can NMFS prioritize data needs?

- There needs to be a mechanism, which is documented and justified, for setting priorities with regular independent review of the program to ensure primary objectives are being met.
- The review should also include a review of the prioritization framework itself.
- Each fishery should be examined independently to assess the needs of that fishery.

- Input from all stakeholders needs to be incorporated in the prioritization of needs including biologists, managers, and fishermen.
- A national bycatch board would help ensure consistent funding and consistent priorities by using a ranking process to justify funding decisions and requests.

Question 5. What can we learn/apply from other regions that are successfully dealing with bycatch? How can we best communicate results of monitoring to stakeholders?

- Collaboration is the key lesson from other regions.
- At a very minimum there should be collaboration within NMFS between regions.
- Ideally, there would be interagency collaboration as well as collaboration with States, NGOs, and other stakeholders.
- There should be an enhanced working relationship with SeaGrant and NOS.
- NMFS Fisheries Information System should take a lead role in fostering collaboration. To foster this collaboration, methodologies should be consistent from one region to another.
- There should be a good plan which will foster buy-in on priorities.
- Communication of results of monitoring should be approached through:
  - query-driven public websites;
  - newsletters;
  - bulletins;
  - radio announcements; and
  - personal contact (important tool for fostering buy-in).
- Outreach, no matter what form, should be consistent and never ending.

Question 6. Are there some fisheries that lend themselves to monitoring using one approach or another?

- Large species with low volume are easier to monitor using electronic equipment (i.e., a video camera on a pelagic longline vessel).
- Smaller species at high volume benefit from direct observer coverage (shrimp fishery).

Question 7. How can we most effectively develop bycatch monitoring programs that address multiple objectives of stock assessment, fishery management, and protected species requirements in an integrated fashion?

- Work cooperatively with all state and federal agencies, NGOs, and recreational fishing organizations.
- As part of this cooperation there is a need to know what data collection programs exist and who or what agency is conducting the collection.
- Using standardized common elements facilitates integration of the data.

## WORKSHOP DISCUSSION

### What are Our Biggest Bycatch Data Gaps in Commercial Fisheries?

- Biggest current priority is bycatch in the red snapper/shrimp fisheries
- State waters in Gulf of Mexico may be under-represented.
- South Atlantic shrimp fishery needs updated data (last study for shrimp 1993).
- Caribbean – Cooperation with fishermen is difficult, suspicious of data use.

### What are Our Biggest Bycatch Data Gaps in Recreational Fisheries?

- No monitoring in Caribbean
- Lack of monitoring on protected species
  - Sea Turtles
  - Marine Mammals
  - Sea birds
- Lack of data on size and maturity of discarded fish

### Challenges in Meeting Data Needs

- Need to look at what is on the horizon
- Priorities shift over time
- Most important fishery is the one we perceive as having a problem
- Need criteria for prioritizing data needs

### Strengths and Weaknesses of Monitoring Programs

- Logbooks
  - Good for overall coverage and effort, but miss sensitive information or may be under-reporting
  - Self-reporting requires comprehensive education program for fishermen
  - Need to provide incentives for reporting bycatch, and minimize disincentives
  - Improvements could be made to improve effort data (spatial/temporal)
- Observer coverage
  - Critical for independent observations
  - Fishing behavior may be modified
  - Costs
- Fisheries need a mix of monitoring for verification
- Data collection methodology needs to be statistically based
- Gear the monitoring method to the fishery
  - Ex: electronic monitoring/video works for large fish/low volume

### Strengths and Weaknesses for Recreational Fisheries

- No bycatch methodology/sampling frame
- There is a pilot program for observers on headboats
- The potential for “angler diary programs”
- Sampling frame needs to apply to both State and Federal waters
  - National license program

### Alternate Methodologies

- Cooperative research
- Electronic methods
  - Cameras
  - Video
- Retain 100% of catch
- Remote observation vessels
- Aerial surveys and satellite imagery
- Stranding programs

### Addressing Multiple Objectives

- Mechanism for setting priorities
- Need to know who is collecting what
- Standardized common elements facilitates integration
  - Use of data may change over time
- Need periodic independent program reviews to ensure primary objectives are still being met

### Increasing Precision

- Precision can always be improved, but at significant cost with diminishing returns
- Labeling data as to its level of precision

### Minimizing Bias

- Minimized through good sampling design
  - A priori info about system
  - Pilot studies
  - Identifying your universe and define your fishery
  - Initially over stratifying sampling
  - Sample in representative seasons and areas
- Logbooks
  - Universal reporting
  - More frequent reporting (recall bias)
  - Mandatory reporting
  - Education program
- Observers
  - Debriefing
  - Mandatory programs
  - Random vessel selection

### Increasing Precision and Minimizing Bias

- Need a laymen's way to explain these concepts to constituents
- Difficult to design sampling for rare events
  - May require unique approach
  - Should not drive overall design
- Costs to get adequate sample size

- Involve data collectors in the analysis

### Prioritizing Data Needs

- Need good criteria for ranking priorities to address science and management objectives
  - Development of criteria needs to be inclusive of all interested parties
- Process and the rankings need to be reassessed periodically
- Having the ranking process justifies the funding decisions and new requests, and promotes buy-in

### Overarching Themes

- Long-term flexible approach to identify data gaps and meet data needs.
  - Less reactionary and more proactive
  - Fend off crises by planning ahead, but be flexible
  - SEAMAP is a good model/foundation
  - Evaluate new types of management approaches
- Collaboration/Coordination
  - Overlapping mandates/needs/data collection programs
  - Inventory of existing programs
  - Common ranking system/definitions/strategy
  - Consistency and compatibility in data elements
  - Bycatch board on regional level that facilitates periodic review and assessment
  - National Bycatch Report
  - Needs input from States
  - Need national coordination of bycatch initiatives
- Funding
  - Sources need to be identified and leveraged where appropriate
- Technologies/Methodologies
  - Observers are essential
  - Multiple data collections to verify and validate
  - Logbooks, VMS, e-logbooks (FDM)
  - Need to be Fishery specific
  - Fishery-independent monitoring
- Communication
  - Intra and inter agency communication
  - Among managers, data users, stakeholders
  - Outreach
    - Use as many mechanisms as possible
    - Be consistent in outreach effort
    - Know your audience, and target it appropriately
    - Personal contacts are best
- Incentives for Industry Participants
  - Incentives for data collection and buy-in on management decisions
  - Sense of ownership of fishery leads to stewardship of resource
  - Sharing successes with fishermen
  - Why should they care?

- How does it affect their bottom line
- Green labeling (Marine Stewardship Council)
  - Access to big markets, economic advantage

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Bycatch is a concern for all stakeholders and resource users. We need to work together to identify solutions. Some key themes from the workshop were:

- Identify better methods to address bycatch in the growing recreational sector;
- Improve communication;
  - Internal and external to NMFS, interagency
  - Outreach and education;
- Integrate programs and consolidate information so it can be more easily distributed and used in decision making;
- Enhance recreational fishing surveys and cooperative research efforts;
- Improve basic understanding of science;
- Make better use of existing resources;
- Employ new technologies – video monitoring and;
- Involve stakeholders in developing incentive-based programs.

Since the workshop was conducted last May, advances have been made to address bycatch. Progress towards reducing and monitoring bycatch in the Southeast Region and other Regions are available on the Web

([http://www.nmfs.noaa.gov/by\\_catch/bycatch\\_strategy.htm](http://www.nmfs.noaa.gov/by_catch/bycatch_strategy.htm)). In addition, the Magnuson-Stevens Fishery Conservation and Management Act was recently reauthorized (MSRA) and will require each region to establish a bycatch reduction program and develop technological devices to minimize bycatch. The bycatch reduction program will be: regionally based; coordinated with the cooperative research projects; provide fishery participants information and outreach; and provide for routine consultation with the Councils to maximize opportunities to incorporate in Council actions program results and incentive programs.

The MSRA contains many items, which were also suggested by participants of the May 2006 Bycatch Workshop. For example, the MSRA authorizes the Councils/Secretary to establish incentive programs to reduce bycatch and bycatch mortality. The MSRA also authorizes the Secretary, in coordination with the Secretary of Interior, to engage in cooperative research with industry. A new section entitled, “Impact of Turtle Excluder Devices (TEDs) on Shrimping,” requires a multi-year, comprehensive in-water study to measure the efforts and effects of shrimp fishery efforts to utilize TEDs, to analyze the impact of those efforts on sea turtle mortality, and to evaluate innovative technologies to increase shrimp retention in TEDs while ensuring the protection of endangered and threatened sea turtles. This section requires the placement of observers on commercial shrimp vessels as needed. In addition, the Secretary, in consultation with representatives of the recreational fishing industry and experts in statistics, technology, and other appropriate fields, must establish a program to improve



the quality of information generated by recreational fishing surveys, with a goal of achieving acceptable accuracy and utility for each individual fishery.

I encourage more people to participate in future workshops and meetings – not just regarding bycatch, but other issues that arise. We have a common goal of sustaining our nation's fisheries and we will be much more successful achieving this goal in a cooperative manner. Money and resources are always an issue, but I'm convinced that working together we can identify innovative methods to monitor and reduce bycatch.

Roy Crabtree

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